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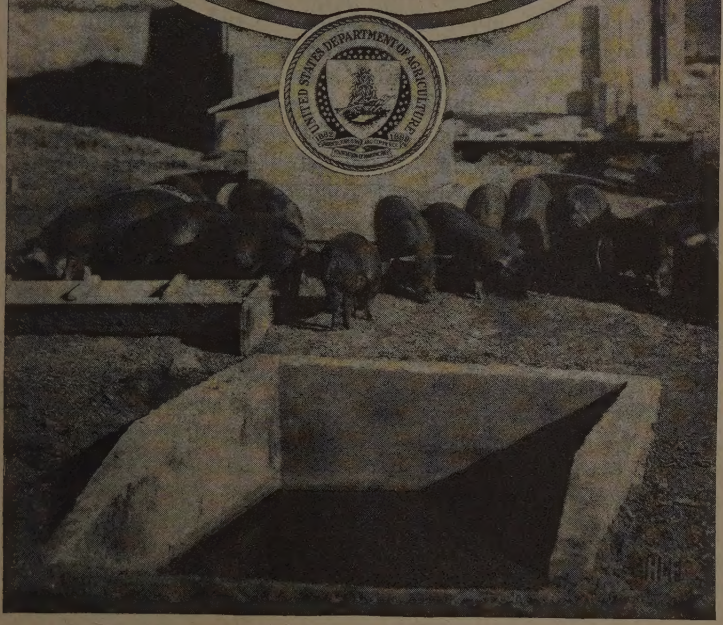
UNITED STATES DEPARTMENT OF AGRICULTURE

HOG·LICE AND HOG ·MANGE·

Methods of Control and Eradication



LICE AND MANGE mites are the two principal kinds of external parasites affecting hogs. They are injurious to all classes of hogs, but the greatest losses occur in pigs and poorly nourished hogs kept in insanitary quarters.

The losses are caused by irritation, unthrifty condition, functional disturbances, arrested growth, low vitality, and increased death rate.

Only one species of lice commonly affects hogs, and this parasite obtains its food by puncturing the skin of the host and sucking blood. It can be eradicated by hand applications, spraying, medicated hog wallows, and dipping. Dipping is the best method of applying treatment. Crude-petroleum and coal-tar-creosote dips are effective remedies.

Two species of mange mites commonly affect hogs. The nature and habits of these mites, the symptoms caused by each species, and the methods of control and eradication are discussed in this bulletin. Crude-petroleum and lime-sulphur dips are effective remedies for common or sarcoptic mange of hogs.

Plans of hog wallows and dipping plants, together with directions for building them and for dipping hogs, are given.

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HOG LICE AND HOG MANGE.

METHODS OF CONTROL AND ERADICATION.

MARION IMES, *Veterinary Inspector,*
Zoological Division, Bureau of Animal Industry.

CONTENTS.

	Page.		Page.
Hog lice	3	Treatment for lice and mange	12
Distribution and economic importance	3	Hand applications	12
Nature and habits	4	Spraying	13
Hog mange	5	Hog oilers	13
Varieties and general characteristics	5	Medicated hog wallows	14
Sarcoptic or common mange	6	Dipping	15
Demodectic (follicular) mange	11	Construction of hog wallows	20
		Construction of dipping plants	22

HOG LICE.

DISTRIBUTION AND ECONOMIC IMPORTANCE.

Hog lice occur more or less frequently on both domesticated and wild hogs in practically all parts of the world. The parasites are prevalent in all parts of the United States where hogs are raised, and live-stock growers generally recognize them as a pest that causes considerable loss to the swine industry.

In obtaining their food the lice puncture the skin of the host animal and suck blood and lymph. A new puncture in the skin is made each time a louse feeds. A single puncture causes considerable irritation and itching, and as each louse feeds at frequent intervals, the irritation and itching is almost constant in cases of gross infestation. In an attempt to relieve the intense itching the infested animals scratch themselves with their feet and rub violently against any convenient object. The frequent rubbing destroys the hair in patches and often causes wounds in the skin. The lice congregate around the abrasions and thus cause further irritation and annoyance to the animals.

Lice may attack hogs of any age or condition, and if allowed to spread the infested animals suffer and the owner loses in the increased quantity of feed consumed per pound of gain, arrested growth of young pigs, and shrinkage in weight of fattening hogs. When young pigs become infested at an early age from the brood sow and the lice are allowed to remain on the animals until the hogs are ready for butchering, the loss caused by the parasites is a considerable item in the cost of producing pork. Estimates based on observations and limited experimental data fix the direct money loss

in such cases at from 2 to 6 per cent of the market value of the hog. The indirect losses caused by lice are seldom taken into consideration, because on casual observation they are not so apparent. Hogs infested by large numbers of lice suffer a lowering of vitality and a generally unthrifty condition which renders them more susceptible to attack by other parasites and by contagious diseases. The damage and losses caused by hog lice are of sufficient importance to warrant the application of treatment for their eradication.

FIG. 1.—Male hog louse.

NATURE AND HABITS.

The hog louse, known technically as *Hæmatopinus suis*, is a blood sucking parasite and one of the largest of the lice affecting domestic animals. The full-grown female often attains a length of one-fourth of an inch. The male louse is slightly smaller and can be distinguished by a black streak on the underside of the abdomen along the middle of the last three segments. The feet are adapted for clasping the hairs, and the lice travel sidewise through the hair or bristles of the hog.

FIG. 2.—Female hog louse and egg attached to hair. (Photomicrograph by Dr. W. T. Huffman.)

The entire life cycle is passed on the host. The females deposit and glue their eggs or "nits" on the hairs close to the skin. This may occur on any part of the body, but the favorite locations are the lower half of the sides, around the neck, shoulders, and flanks. The female lays from 3 to 6 eggs a day and the average length of the egg-laying period is about 25 days. The average number of eggs laid by the female louse during her lifetime is about 90. The eggs hatch on the host in from 12 to 20 days, the majority hatching in from 12 to 14 days. The young lice become active soon after hatching and seek the parts covered by tender skin for feeding. The favorite location for young lice, especially during cold weather, is the inside of the ear, where they often congregate

in large clusters and where the skin is tender and they are protected from the cold and also from the efforts of the host to dislodge them. When a suitable place is found the young louse punctures the skin with its sharp mouth parts and sucks blood until satisfied.

Hog lice do not remain attached to the skin like ticks, but detach after each feeding and wander about through the hair or remain quiet, either singly or in groups. They feed at frequent intervals and develop rapidly. The young lice reach maturity and mating occurs when they are about 10 days old. The females begin laying eggs when they are about 12 days old and the average length of life is about 35 days.

Except in accidental cases, hog lice are found only on hogs, and they do not voluntarily leave their natural host. When separated from the animal they live only two or three days. The lice pass readily from one hog to another when the animals come in close contact. Practically all cases of infestation occur from contact with lousy animals and not from infected premises. Under reasonably good sanitary conditions pens, corrals, and premises which have contained lousy hogs are not a source of danger to hogs free from lice. As a precautionary measure, however, and because it is good sanitary practice, all small inclosures which have contained lousy hogs should be cleaned and disinfected before being used for a new lot of hogs. The litter and manure should be removed and the floors cleaned, after which the woodwork and floors should be sprayed with a good disinfectant. The coal-tar-creosote dips, diluted in accordance with instructions on the container, are suitable for this purpose.

HOG MANGE.

VARIETIES AND GENERAL CHARACTERISTICS.

Scabies in hogs, commonly known as mange, is a term applied to two contagious skin diseases caused by insectlike parasites known as "mites," which live in the skin. The two species of these parasites which affect hogs are classified in two different genera—*Sarcoptes* and *Demodex*.

Mange mites spend their entire life on the host animal. In obtaining their food from the tissues and blood of the affected animal the parasites cause wounds or lesions in the skin. As each kind of mite possesses distinctive habits in its manner of feeding and other activities, the nature and location of the lesions caused by them are more or less characteristic. The sarcoptic mites, which cause common hog mange, burrow into the skin, each female making a separate gallery in which she lays her eggs. The skin over and around the burrow or gallery becomes irritated and inflamed and a small cone-shaped swelling is formed. The demodectic mites, which cause demodectic or follicular mange, are very small and in appearance

somewhat like microscopic worms. They live in colonies or groups in the hair follicles and sebaceous glands and cause small, spherical, hard swellings.

SARCOPTIC OR COMMON MANGE.

Sarcoptic or common mange occurs in hogs in the United States much more frequently than the follicular variety. Although the disease has not become highly prevalent in any one section, it seems to be increasing throughout the Corn-Belt States. Other sections of the country, even those parts of the West where a comparatively small number of hogs are raised, have more or less hog mange. Traffic in breeding stock evidently has been an important factor in spreading the disease. Like scab in other species of animals, hog mange spreads rapidly under favorable conditions unless active measures are taken for its control. Although pigs, young growing stock, and old, poorly nourished animals of low vitality suffer most from the ravages of mange, the disease often attacks vigorous, mature hogs and causes great losses. The losses are caused by irritation, arrested growth, unthrifty condition, decreased vitality, functional disturbances, and increased death rate. The disease, however, can be eradicated, and if proper methods are adopted before it becomes advanced the losses can be reduced to a minimum.

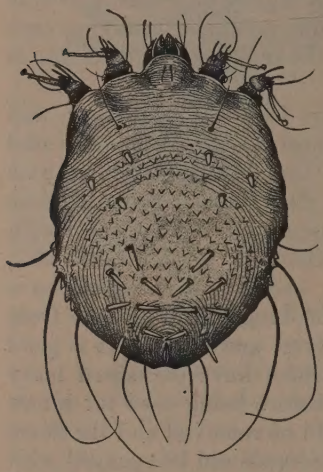

FIG. 3.—Sarcoptic mange mite. Female. Magnified 100 times.

THE SARCOPTIC MANGE MITE.

The mites which cause sarcoptic mange are small, whitish-colored parasites known technically as *Sarcoptes scabiei suis*. The mature female measures about one-fiftieth and the male about one-sixtieth of an inch in length. Although they are visible to the naked eye, particularly if placed on a dark background, it is advisable to use a low-power magnifying glass in examining scrapings or material suspected of containing the mites. The general form of the body is round and the bluntly rounded head is as broad as it is long. When mature these mites have four pairs of short, thick legs, the fourth pair and usually the third pair not extending beyond the margin of the body. A conspicuous feature under a high-power microscope is the presence of a considerable number of short, backward-projecting spines on the upper surface of the body.

The entire life cycle is passed on the body of the host animal. The mites penetrate through the upper layer of the skin and excavate burrows or galleries in which the eggs are laid. Each female may lay from 10 to 25 eggs during the egg-laying period, which probably lasts from 12 to 15 days, after which the female dies in her burrow. The eggs hatch in from 3 to 10 days and the young mites after passing through several molts reach maturity and begin laying eggs in 10 or 12 days. As the surface of the skin constantly is wearing away and being renewed from below, the young mites are close to the

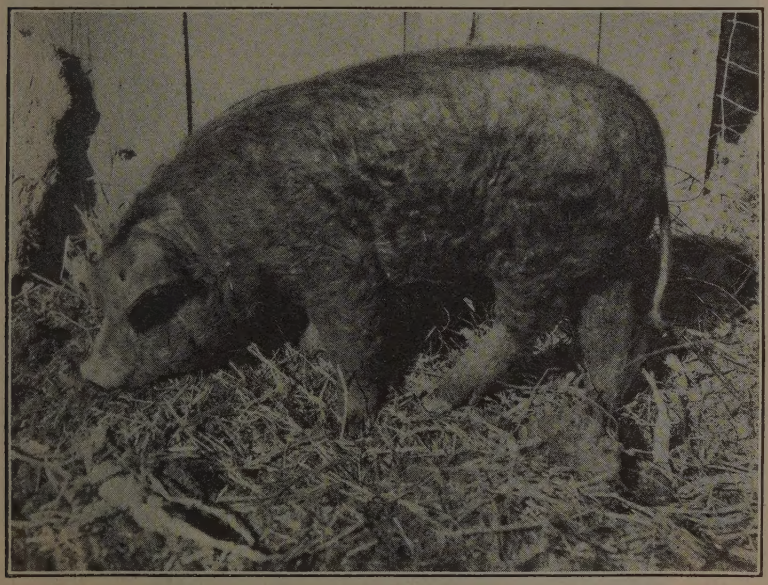

FIG. 4.—A case of hog mange in the early stages of the disease.

surface when they hatch out. They escape from their shallow burrows and form new ones in which they in turn deposit their eggs.

As the average period of incubation on the animal is about 4 days and the average period after hatching until egg laying begins is about 11 days, a new generation of mature mites may be produced about every 15 days.

SYMPTOMS OF COMMON MANGE.

Sarcoptic mange of hogs may start on any part of the body but in the early stages of the disease the lesions usually are found on the head, around the eyes, nose, or ears. From these parts it spreads over the neck and shoulders and along the back and sides, finally involving the entire body.

The parasites penetrate the upper layer of skin, each one forming a separate burrow or gallery in which it lives. The presence of the mites on the "quick" or sensitive tissues causes great irritation and the skin over and around each burrow becomes inflamed and swollen. These swollen areas are somewhat larger than pinheads and often have a yellowish-colored granule of dried serum adhering to them. As the mites multiply, the diseased area increases and the granular or raised areas become closer together. The hair over the affected

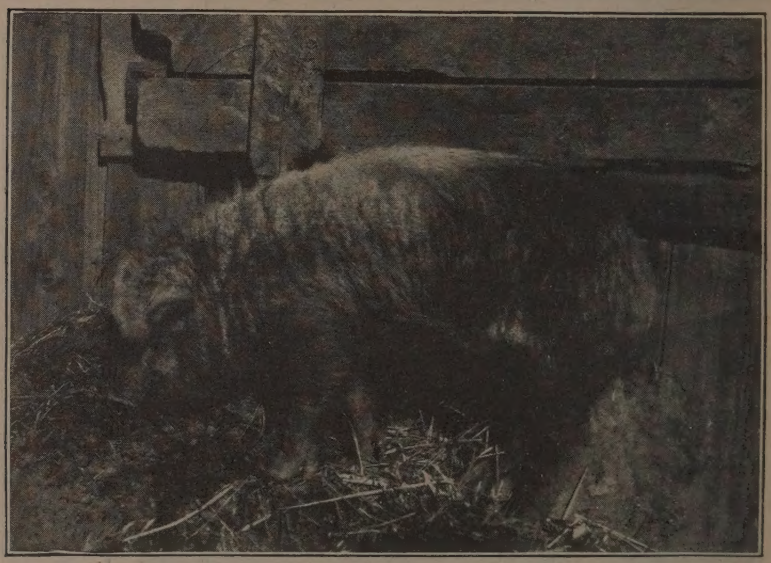

FIG. 5.—A case of advanced hog mange showing wrinkled condition of skin.

part stands erect and some of it drops out or is rubbed off, though usually a few scattering hairs remain even in advanced cases. The affected areas of skin often take on a dry, scurfy, or leatherlike appearance, especially when the mites are not very active. Such cases are known as the dry form of mange, and in this form the rubbing of the animal often has a sort of polishing effect upon the dead scales of the skin and the dried serum, and the affected areas may have a dry, slightly glistening, silver-gray appearance.

The intense itching causes the animal to scratch and rub the affected parts until the skin becomes raw. The mechanical injury thus caused results in a running together of the small granular areas and large scabs are formed. The large scabs, which are firmly attached to the underlying skin, often are broken by the movements of the animal and blood and serum ooze out of the cracks. The surface of the lesion may have a dry, pearl-gray appearance or it may be

moist and stained a reddish yellow by blood and serum. In chronic cases the odor from the moist form sometimes is very offensive.

As the disease advances the skin becomes more or less bare and is hard, greatly thickened, and thrown into wrinkles or folds. The furrows formed by the wrinkles are thickly inhabited by mites and

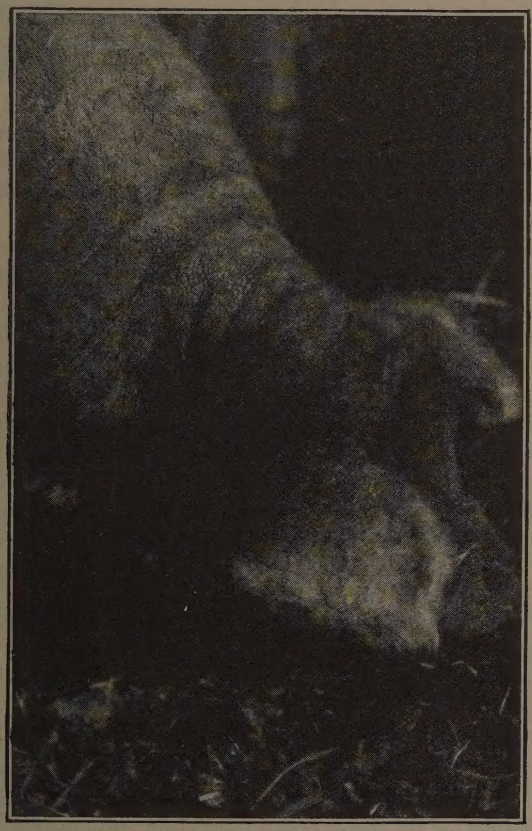

FIG. 6.—Advanced hog mange showing pedicel-like scabs.

scrapings taken from the bottom of a fold usually contain the parasites in abundance. In severe cases the animals rapidly lose flesh, become emaciated and greatly weakened, and unless properly treated many of them will die.

The most certain diagnosis consists in finding the mites, which are the sole cause of the disease. On account of their burrowing habits the parasites often are difficult to find, especially in the early stages of the disease. By scraping the affected area with a blunt-edged knife until the blood flows and examining the scrapings in the

warm sunshine or near artificial heat under a low-power magnifying glass the mites may be found. In doubtful cases the scrapings may be steeped in a 10 per cent solution of caustic potash and examined under a microscope.

Contagiousness of Common Mange.

Sarcoptic or common mange of hogs is contagious and is usually spread by direct contact with infected animals. The disease is readily transmissible to man and also from hogs to some other species of animals, but in such cases the mites generally live only a limited time on the new host. The disease may persist in man, however, for 30 days or longer and cause extreme annoyance. It is advisable, therefore, to bathe and change clothing as soon as possible after handling mangy hogs.

As the sarcoptic mites live in their burrows they do not spread to other animals so rapidly as those varieties which live solely on the surface of the skin, but on account of the hogs' habit of sleeping in close contact with one another the disease often makes great headway in herds confined in pens or stables. The infection spreads rapidly under various insanitary conditions, such as crowded or unclean quarters, exposure to cold, inclement weather, insufficient feed of poor quality, or any other circumstance tending to lessen the vitality or functional activities of the animals. The spread of the disease is not limited to any one season of the year, although healthy hogs seldom become infected during the summer months, especially if they have access to green succulent feed and are kept in open lots or fields where they are exposed to the sunshine.

Hogs of all classes, ages, and conditions are susceptible to sarcoptic mange, but usually the disease does not spread rapidly in well-fed, vigorous animals kept in sanitary quarters. The weak, unthrifty animals are the first to show lesions of the disease after exposure to the infection and the mites spread from them to other hogs with which they come into contact. Visible lesions of mange may develop in from 15 to 45 days after exposure, or a much longer time may elapse before the exposed hogs show indications of infection. Cases of mange may become generalized in 6 weeks, or a much longer time may elapse before the lesions spread to any great extent.

One or more attacks of the disease do not confer immunity, and after the disease has been cured the animals may become reinfected by contact with infected hogs or possibly by confinement in small inclosures in which mangy hogs have recently been kept. While practically all cases of hog mange seem to originate from contact with infected animals, the possibility of animals becoming infected from infected premises should not be overlooked. Although the mite will not reproduce itself except on the bodies of animals, it is able to live for two or three weeks when removed from hogs, and

under favorable conditions may live much longer. Dislodged eggs which drop in moist, protected places may retain their vitality for from two to four weeks during mild weather. In dry places exposed to bright sunshine the mites and eggs are destroyed in a few days.

While the results of a large number of experiments indicate that hogs do not contract mange from infected premises, nevertheless, in actual practice, cases occur which seemingly can be explained on no other ground. It is advisable, therefore, to clean and disinfect all hog houses, pens, sheds, or small inclosures in which mangy hogs have been confined before using them for healthy hogs. Remove all litter and manure, cleaning down to a smooth surface, then spray all walls, woodwork, and floors with a good disinfectant. The coal-tar-creosote dips and disinfectants diluted in accordance with instructions on the containers are suitable for this purpose. The manure or litter from infected pens or buildings should be spread on the ground and plowed under or disposed of in such manner that hogs can not come into contact with it, and all troughs and implements used in the infected inclosures should be immersed or washed in the disinfectant.

DEMODECTIC (FOLLICULAR) MANGE.

Demodectic or follicular mange of hogs is caused by minute worm-like mites known technically as *Demodex phylloides* or *Demodex folliculorum suis*. Similar follicle mites occur in dogs, cattle, and other animals, and also in man. The parasites are truly microscopic in size, the full-grown female measuring approximately one one-hundredth of an inch in length. They penetrate into the hair follicles and sebaceous glands of the skin, where the entire life cycle is completed. When present in small numbers they apparently cause the animal no serious inconvenience, but occasionally they increase rapidly and cause well-marked lesions in the skin of the affected animal. The disease is contagious to all classes of hogs.

The lesions usually appear first on the snout or around the eyelids and spread slowly from these parts over the underside of the neck, breast, abdomen, inner sides of the hind legs, and other parts of the body where the skin is thin and tender. The back and upper part of the sides where the skin is thick and tough usually are not affected. In the early stages of the disease the affected skin may be red and scurfy, and small, hard, nodular lumps ranging in size from that of a pinhead to that of a hazelnut appear in the skin. The nodules may be dark red or they may be light red with a whitish or cream-colored center. As the disease advances the nodules break and discharge a creamlike pus or lumps of matter of a cheeselike consistence. Two or more of the nodules may break and run together, forming suppurating cavities.

There is no known specific cure for demodectic mange, although frequent dippings in crude petroleum check the progress of the

disease and heal many of the old lesions. Herds in which demodectic mange appears should be dipped in or treated with crude petroleum, and any animals having advanced cases which do not respond to treatment should be killed. The remainder of the herd should be fattened for market and disposed of and the premises cleaned and disinfected before being restocked with healthy hogs. The cleaning and disinfecting of premises occupied by hogs infected with follicular mange should be performed in the same manner as for sarcoptic mange.

TREATMENT FOR LICE AND MANGE.

The five commonly used methods of applying treatment for external parasites of hogs are (1) hand applications, (2) spraying, (3) hog oilers, (4) medicated wallows, and (5) dipping. The best method to adopt naturally depends upon the number of hogs to be treated, the season of the year, the remedies selected, and the facilities available. While both mange and lice can be eradicated by proper hand applications, this method of applying treatment is practicable only when a few hogs are to be treated.

If no dipping vats or wallows are available or if the weather is too cold for dipping, hand applications are beneficial in checking the spread of lice or mange until the weather is suitable and arrangements can be made for dipping. Treatment of hogs in a dipping vat or in medicated wallows during the mild weather of autumn is a good insurance against the risk of loss from mange and lice and the probable additional expense of winter treatment. In applying treatment for either mange or lice the entire herd should be treated whether all the animals show infection or not.

HAND APPLICATIONS.

On account of the difficulty of restraining hogs and of covering the entire surface of the body by hand applications, this method of applying treatment should be used only as a temporary makeshift until the animals can be dipped or treated in wallows. The following remedies, when applied by hand, have proved to be effective for lice and mange: (1) Crude petroleum, (2) cottonseed oil and kerosene, equal parts, and (3) kerosene and lard mixed in the proportion of one-half pint kerosene to 1 pound of lard. These remedies may be applied with a brush, mop, or cloth and they should be distributed in a thin, even coating over the entire surface of the head and body, including the inner surfaces of the ears and between the thighs. When treatment is being applied for mange special care should be taken to see that all spots of scab are well coated. Freshly oiled or greased hogs should not be moved rapidly, exposed to bright sunshine, or allowed to become chilled, as injury to the animals may result.

Crude petroleum is the most effective known remedy for lice and mange and on account of its spreading, adhesive, and protective qualities it is the most suitable for use in hand applications. It may be applied with a can having a flattened spout or from an ordinary sprinkling can having large holes in the sprinkler. The practice of throwing feed on the ground and sprinkling oil on the hogs while they are eating is not recommended, because more or less of the oil falls on the feed and is consumed by the animals. A better method is to restrain the hogs during the application of the oil by crowding them in small pens or inclosures. When the oil is applied by sprinkling or pouring, it usually does not reach the inner surface of the ears, which should be given supplementary treatment with a swab that has been dipped in the oil.

SPRAYING.

Spraying is not so economical or effective as dipping because of the difficulty of thoroughly wetting hogs with a spray from an ordinary spray nozzle. Much of the dip runs off and is wasted, and unless plenty of it is used and the spraying is continued until all parts are well soaked the treatment will not be effective. Mange and lice can be eradicated by spraying, however, if the work is done properly. An ordinary hand spray pump is suitable for the purpose, or where an orchard-spraying outfit is available it may be used. Any of the dips recommended for scab may be applied in the form of a spray and the interval between sprayings should be the same as those between dippings.

HOG OILERS.

Hog oilers or rubbing posts are devices so arranged that when a hog rubs against them a small quantity of oil is deposited on or near the spot of skin being rubbed. They may be divided into two general classes: (1) Homemade rubbing posts and (2) the patented hog oilers. The first usually consists of a post set firmly in the ground and wrapped securely with gunny sack or rope that is kept saturated with oil. The oil is poured over the post covering from time to time or a can of oil is fastened to the top of the post and the rope or gunny sack is kept saturated by fastening the upper end in the vessel of oil. There are various types of patented hog oilers on the market and many hog growers in the Corn-Belt States have one or more of them in their hog lots.

When a hog desires to rub itself it does not go to a rubbing post or hog oiler unless it happens to be close to one, but it rubs against the first convenient object it finds. At best only a limited area of skin

is covered with oil when a hog rubs against an oiler; consequently the various oiling devices are not successful in eradicating external parasites. When the oil containers are kept supplied with oil and the machine not allowed to become clogged with mud, the use of hog oilers tends to lessen the spread of lice and mange, but they should not be depended upon to effect eradication or even to prevent the losses caused by gross infestation of mange mites or lice.

MEDICATED HOG WALLOWS.

The instinctive habit of the hog to wallow in water when the weather is warm may be taken advantage of in applying treatment for external parasites. By medicating the water in properly constructed wallows (for plan see fig. 8, p. 21) remedies for lice and mange may be applied in a satisfactory manner with a minimum expenditure of money, time, and labor. If the results from the use of medicated wallows are to be satisfactory, however, it is necessary to consider the nature and habits of the animals to be treated and plan accordingly.

If conditions are such that hogs may exercise choice in the matter, they invariably select shallow water in which to wallow. When a hog wades into water it apparently tries to measure the depth and learn the nature of the bottom by submerging its nose and face, and if the water is too deep the animal may squat on its haunches or assume a recumbent attitude, resting on its chest and abdomen with the legs folded under and the head elevated, but it does not lie down on its side. If the water is sufficiently shallow so that the nostrils can be kept above the surface of the liquid easily the hog lies down on its side and rolls and then gets up and repeats the operation on the other side until the entire surface of the body is wet. As a volume of liquid is displaced when a hog lies down in the wallow the water line is raised accordingly, and the greater the number of hogs lying in the wallow at one time the higher the water line is raised. The proper depth of liquid in the wallow, therefore, depends upon the size and number of hogs using the wallow.

For pigs weighing from 40 to 80 pounds the wallow should be charged with liquid to a depth of about 3 inches. For hogs weighing from 80 to 150 pounds about 4 inches of liquid is sufficient. The depth may be increased to 5 or 6 inches for heavier hogs, but the medicated liquid in the wallow should never be so deep that the hogs are afraid to lie down and wallow in it. When only one wallow is available for a mixed lot of hogs of various sizes, from 3 to 4 inches of liquid will give better results than a greater depth. The water should always be shallow and no medicine added until the hogs have become

well accustomed to using the wallow. After the habit of using the wallow is well fixed, which usually requires 3 or 4 days, the depth may be increased if necessary and the medicaments added.

The wallow should not be kept medicated continuously, as the medicament when applied too often is liable to cause irritation and the hogs may refuse to use the wallow after a few days. In from 24 to 48 hours after the liquid in the wallow has been medicated all hogs probably will be well soaked and the wallow should be drained and cleaned and recharged with water only. Medicaments may be added every week or ten days until the desired results are obtained.

Hogs are liable to drink from the wallows unless the water is denatured by some substance distasteful to them. Because of its denaturing qualities, its tendency to spread over the surface of the body, and its effectiveness as a remedy for external parasites, crude petroleum is the most suitable dip for use in hog wallows. In using it in wallows add about 1 pint for each pig and about 1 quart for each hog. Observe whether all the animals use the wallow and whether their bodies are well coated with the oil. If all are not well coated add more oil to the wallow.

The oil floating on the surface of the water limits or prevents evaporation and if the wallow is exposed to the direct rays of the sun during the hot summer months the water becomes heated to such a degree that the hogs will not lie in it. It is advisable, therefore, to construct a shade over the wallow or to add the oil in the evening. Oil added after sundown usually is carried out on the bodies of the hogs before noon of the next day.

A shady, well-ventilated place should be provided for freshly oiled hogs. All wallows should be drained and cleaned as often as necessary to keep them and the surroundings in good sanitary condition.

DIPPING.

Dipping consists in immersing animals in a medicated liquid that will kill the parasites. It is the most effective known method of applying treatment. Dipping plants are usually arranged so that the hogs enter one end of the vat filled with dip, swim through, and leave the vat at the opposite end. During dipping, the liquid in the vat should be from 40 to 48 inches deep, which is sufficient to swim the tallest animal. The quantity of dip necessary to complete the work should be ascertained and materials sufficient to make that quantity provided before the work of preparing the dip is begun. The average 100-pound hog will carry out and retain from 1 to 1½ pints of dipping solution and full-grown hogs will retain about 1 quart. The total estimated quantity of dip which the animals

carry out and retain plus what is required to charge the vat should equal the total quantity required to complete the work if none is lost by leakage or otherwise.

The capacity of the vat is usually calculated in the following manner: Multiply the average length in inches by the average width in inches, then the product by the depth in inches; this will give approximately the number of cubic inches of space to be filled with dip. Divide this by 231 (the number of cubic inches in a gallon), and the result will be approximately the number of gallons of dip required to charge the vat. To obtain the average length add the length at the bottom to the length at the top (that is, at the line to which the vat is to be filled), and divide the sum by 2. Obtain the average width in the same manner. The depth should be taken at the middle of the vat, and should be from the bottom to dip line only and not to the top of the vat. Likewise, in determining the length and width, measure only the space to be filled with liquid and not above that line. The capacities of any tanks that are used are obtained by a like process. Gauges or rods should be prepared and marked to show the number of gallons at various depths in the vat and tanks.

After the vat is filled to the required depth with any of the dips except oil, the contents should be mixed well by stirring, in order that the dip may be of uniform strength and temperature throughout. A good method of stirring the dip is to take a pail or empty dip container in which a wire bail has been fastened, attach a rope or dipping fork to the bail, allow the vessel to fill and partially sink, then drag it rapidly from one end of the vat to the other, repeating the operation several times.

Before beginning operations the pens, chutes, slide board, vat, etc. should be examined for projecting nails, broken boards, or any object that may puncture or wound the hogs, as the dip may injure those having fresh wounds. Before bringing the hogs to the vat they should be watered, so they will not be thirsty at the time of dipping. They should be handled as carefully as possible and pigs should be "cut out" and dipped separately from the full-grown hogs. To prevent the hogs from piling up and drowning in the dip a gate or other means of checking them and allowing them to pass only as there is room in the vat should be provided in the chute at the intake to the vat.

Men with dipping forks (fig. 7) should be stationed along the vat to render assistance and to keep each animal's body submerged while it is swimming through the vat. The head of each animal should be completely submerged at least once before it leaves the vat. When

the heads are ducked the air inclosed in the ears may prevent the dip from wetting their inner surfaces or coming into contact with lice or mange in the lower folds. Care should be taken, therefore, to see that the dip enters the ears of each animal as it passes through the vat. This may be accomplished by slowly pushing the head low enough in the dip so that the liquid flows into the ear from the underside while the air escapes at the top. Splashing the dip with a broom over and into the ears of the animals as they swim through the vat is also a satisfactory method. Dipping forks for handling the animals in the vat, keeping the body submerged, and ducking the head may be purchased ready-made or may be made to order by a blacksmith. (Fig. 7.)

FIG. 7.—Two styles of dipping forks.

After the hogs leave the vat they should be held in draining pens or chutes until all surplus dip has drained off them. They should not be driven long distances or compelled to move rapidly within 24 hours or even longer after dipping, as injury may result from too much exercise or overheating shortly after dipping, especially if oil is used.

Hogs should not be dipped in stale dip that has been used and then allowed to stand for a long time. The dip in the vat should be changed as soon as it becomes filthy, regardless of the number of animals that may have been dipped in it. In cleaning the vat the entire contents, including the sediment and foreign matter, should be removed.

DIPS FOR HOGS.

In selecting a dip for external parasites of the hog the effectiveness of the dip, the effect on the animals, the cost of materials and labor, and the number of applications necessary to effect eradication are important factors to be considered. The less the number of applications necessary to produce the desired results the greater the saving will be in time, money, and labor. While there are several dips on the list recommended for lice and mange, crude petroleum is the only one that will eradicate both lice and mange with one dipping. When crude petroleum is used for dipping no heating equipment is necessary and any kind of reasonably good water may be used. The oil does not apparently injure hogs if the freshly oiled animals receive proper care and attention. Crude petroleum is the most effective and economical known dip for mange and lice, and when it can be obtained its use is recommended in preference to the other dips described.

Crude-Petroleum Dips.

Unprocessed crude petroleum is the natural crude oil which has not been subjected to any manufacturing process, and it is probably the most effective crude-oil dip. However, processed crude petroleum, known to the trade as fuel oil, which is the residue from the manufacture of gasoline and other light hydrocarbons, is commonly used as a hog dip and it is effective in eradicating lice and mange. Processed crude oils vary greatly in the number and relative percentages of their constituents and consequently in their consistence. As a rule, the thinner the processed crude oil is the better it is as a dip for hogs. The thick, heavy residue left after the extraction of the lubricating oils is not suitable for use as a dip.

Small quantities of distillate are sometimes added to fuel oil and the product sold at a high price as a special oil having a high degree of efficacy in eradicating mange and lice. The effectiveness of fuel oil for mange is increased by adding distillate or kerosene in the proportion of about 1 gallon to each 10 gallons of fuel oil. Heavy processed oils should be diluted with distillate until they flow freely from the container at the usual dipping temperature, but the maximum quantity of distillate added should not exceed 20 per cent. There are also on the market several proprietary brands of crude-petroleum dip, consisting of processed crude oil to which other ingredients have been added. They usually are effective but cost more than the unmedicated crude oil.

In dipping hogs in crude-petroleum dip, fill the vat with water to within about 6 or 8 inches of the dip line, after which add the oil. The oil floats on the water, forming a layer from 6 to 8 inches deep, depending on the quantity added, and as the hogs swim through the vat their bodies become coated with the oil. The oil dips are used cold, and one dipping usually is sufficient to eradicate lice or mange. When crude-oil dip is used it is not necessary to retard the progress of the animals through the vat, as their bodies become coated when they swim directly through.

Lime-Sulphur Dip.

Lime-sulphur dip is effective in eradicating hog mange when four or more dippings are given with an interval of six or seven days between dippings. It is not effective against hog lice. In dipping hogs for mange the lime-sulphur dip should be used warm. The temperature of the dip while the animals are in it should be maintained at from 95° to 100° F. and visibly affected animals should be held in the dip three minutes.

Lime-sulphur dip is made in the proportion of 12 pounds of unslaked lime (or 16 pounds of commercial hydrated lime) and 24 pounds of flowers of sulphur to 100 gallons of water. The lime and sulphur should be weighed and the water measured; do not trust to guesswork. Slake the lime in a shallow, water-tight box or tank and add water enough to form a thin paste. Sift the sulphur into the paste and mix well with a broad hoe until a mixture of about the consistence of mortar is formed, adding water as required. Put the mixture into 30 gallons of boiling water, adding it slowly so as not to interrupt the boiling, and boil until the sulphur disappears from the surface. The boiling should be continued from 1½ to 2 hours without cessation and the mixture stirred to prevent settling and caking on the bottom. When the sulphur has disappeared from the surface and the mixture is of a chocolate or dark-amber color the boiling should be discontinued.

The contents of the boiling tank should be drawn off or dipped out and placed in the settling tank and allowed to stand until all solids have settled to the bottom and the liquid is clear. The use of some sort of settling tank provided with a bunghole is an absolute necessity, unless the boiler is so arranged that it may be used for both boiling and settling. An ordinary water-tight barrel will serve very well for a settling tank at a small vat. A settling tank of any kind should have an outlet at least 4 inches from the bottom in order that the clear liquid may be drawn off without its becoming mixed with any of the sediment. Drawing off the liquid as indicated above has an advantage over dipping it out, for the reason that in the latter case the liquid is stirred more or less and mixed with the sediment. The prime object is to get the clear liquid without any sediment; the latter under no circumstances should be allowed in the dipping vat, as it may injure the animals.

When the sediment has fully settled draw off the liquid into the dipping vat and add warm water enough to make a total of 100 gallons of dip. When mixed and cooked as specified above, the concentrate is 3⅓ times the strength required for the dip in the vat, so that to every 30 gallons of such concentrate 70 gallons of warm water should be added to make a dip of the required strength.

In preparing lime-sulphur dip in large quantities several hundred gallons of concentrate are often made at one time in a single large cooking tank. The quantity made at one boiling is limited only by the facilities at hand. If the boiling tank is of sufficient capacity, a large enough quantity of dip should be cooked at one time to dip the herd. The quantity of mixture in the cooking tank may be varied at will, but the proportions of the various ingredients should not be altered.

Proprietary brands of lime-sulphur dip may be purchased, and many of them are equal to or even better than the homemade product.

Ready-prepared dips should be diluted and used in accordance with instructions on the container.

Coal-Tar-Creosote Dips.

The coal-tar-creosote dips when properly used in soft water are fairly effective in eradicating hog lice if two or more dippings are given with an interval of 15 or 16 days between dippings. This is necessary because the first dipping does not destroy the eggs. These dips have not proved to be dependable remedies for mange. They may be used cold or warm, but the temperature of the dip while the hogs are in it should not exceed 95° F.

These dips are sold under many different trade names, and the principal ingredient is so-called creosote oil which is made soluble in or miscible with water by means of soap. In the undiluted coal-tar-creosote dips, especially in cold weather, a separation of naphthalene and other constituents of the dip may occur. Care should be taken, therefore, to see that the dip is homogeneous in character before using any portion of it. These dips should be diluted for use in accordance with the directions given on the containers.

Arsenical Dip.

The arsenical dip as used for eradicating cattle ticks in the Southern States is an effective remedy for hog mange when 4 dippings are given with intervals of 6 or 7 days between dippings. As crude-petroleum dip is much more economical and effective, the use of arsenical dip for hogs is not recommended except when a farmer in the southern tick area may have a few infected hogs that he can dip in a cattle vat.

CONSTRUCTION OF HOG WALLOWS.

Hog wallows should be built on ground having good drainage and the surface of the ground should be graded so that there will be no depressions in which water may form pools. When shallow pools or mudholes are accessible the hogs seem to prefer them to any other kind of wallow. It is necessary, therefore, to locate the wallow and arrange the pens so that during treatment the hogs will not have access to any wallows except the one designed for the purpose.

The style of wallow commonly used is shown on the front cover. It may be constructed of either concrete or lumber, the former being preferable because it is more durable and in the long run more economical.

The length and breadth of the wallow may vary, depending upon the individual taste of the owner and the number of hogs kept on the farm. While it is an advantage to have the wallow large enough to accommodate the entire herd at one time, it is not necessary, because all the hogs usually do not visit the wallow at the same time. A wallow of the style and size shown in the plans (fig. 8) will easily accommodate a herd of 20 hogs of various ages.

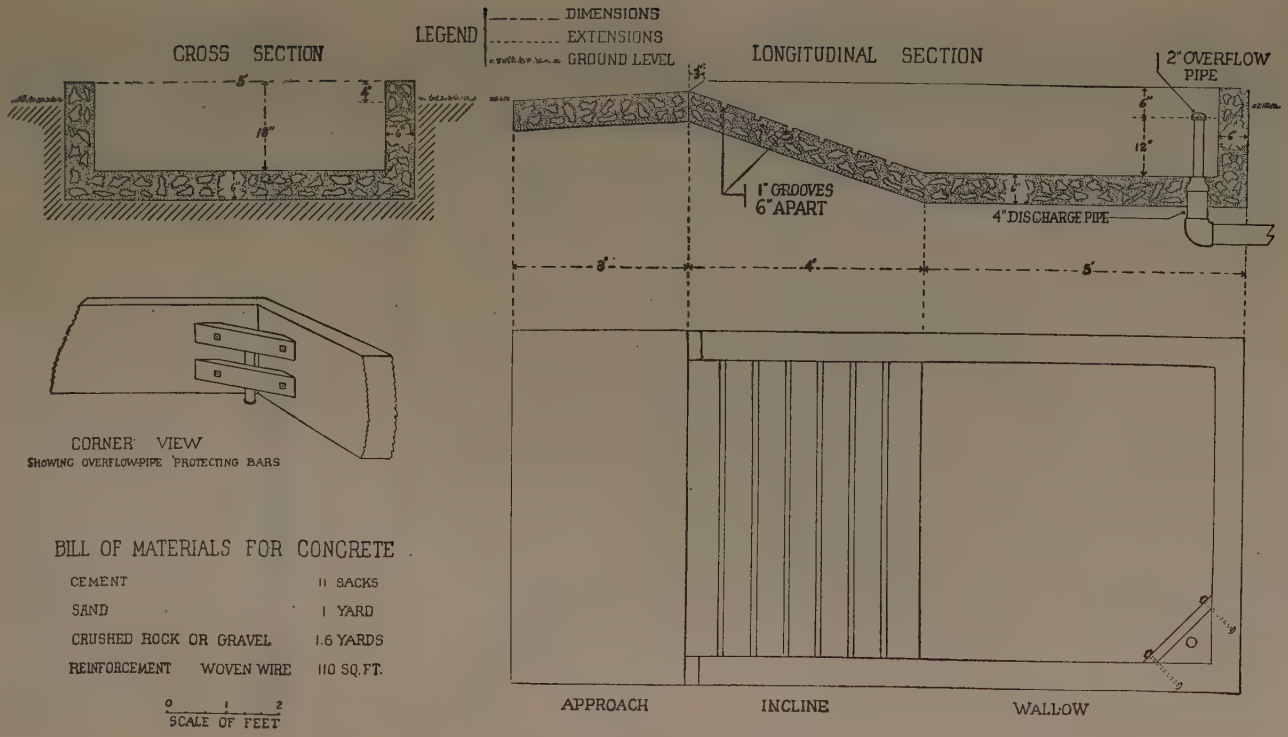

FIG. 8.—Plan of hog wallow—concrete construction.

The top of the side and end walls should extend at least 4 inches above the surface of the ground to prevent surface water from running into the wallow. The entrance and exit incline should have a gradual, easy slope, so that the hogs may safely enter and leave the wallow. To prevent slipping, the concrete floor of the incline should be roughened with a broom soon after it is laid and grooves made in it with a bar, or bricks may be set on edge in the concrete to form cleats or toe holds.

In the Northern States, where the winters are cold, the side and end walls usually are extended into the ground below the frost line to prevent the heaving and cracking of the concrete. In such cases a tar-filled joint is made where the floor joins the walls. The walls and floors should be reinforced with heavy woven fence wire. Place the woven wire in the forms so that it will be embedded in the center of the walls. In building the floor and exit incline, lay the woven wire on top of a 3-inch layer of concrete and cover with a layer of equal thickness.

The system commonly used for draining hog wallows is shown in the plans (fig. 8). The overflow pipe which connects with a discharge pipe acts as a plug when it is screwed into its threaded connection at the floor level. To drain the wallow unscrew the overflow pipe at the floor level. The overflow pipe should be protected so that hogs can not rub against it. This may be done by bolting two pieces of scantling across the corner, as shown in the plans. The bolts and pipe connections should be placed in position before the concrete is laid. The approach to the entrance end of the wallow should be paved with concrete or stone to prevent the forming of mudholes and to protect the ground supporting the floor of the incline.

The general instructions concerning excavations, forms, etc., for dipping vats are applicable to hog wallows and the concrete should be prepared and laid in the same manner.

CONSTRUCTION OF DIPPING PLANTS.

Small herds of hogs such as are kept on the average farm may be dipped in a portable galvanized-iron hog vat, which can be purchased ready-made and answers the purpose very well. (See fig. 9.) In setting the vat an excavation should be made the dimensions of which slightly exceed the outside dimensions of the vat, except the depth, which should be less, so that when the vat is set in the trench the top may extend about 6 inches above the surface of the ground. A crowding chute

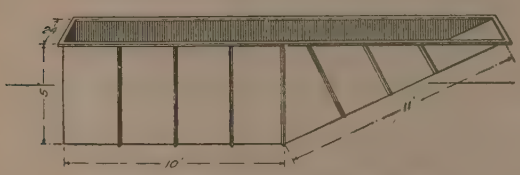

FIG. 9.—Portable galvanized-iron dipping vat.

and a running chute ending in a slide board at the intake end of the vat should be provided and a draining pen or chute should join the vat at the exit or sloping end.

On farms where large numbers of hogs are raised or fed, a permanent dipping plant is more satisfactory and in the long run more economical. Two styles of dipping plants are shown in the plans (figs. 10 and 11), and the chutes, settling well, etc., shown in one set of plans may be substituted if desired for those shown in the other.

SELECTING A LOCATION.

In selecting a location for a dipping plant the fact that animals work better upgrade should be considered, and the corrals and running chute should slope up to the entrance end of the vat. The vat should be on level ground, preferably extending north and south, with the entrance at the south and the exit at the north, as it has been observed that animals work better when not facing the sun. A considerable quantity of water is used in dipping, so the dipping plant should be close to an adequate supply. The vat, however, should not be built on low, marshy land or where flood waters overflow.

PENS AND CHUTES.

The receiving corrals or pens into which the hogs are driven preparatory to dipping should have an opening directly into the forcing or crowding chute. If the draining pens are not large enough to hold the entire herd, holding pens should be provided for the freshly dipped hogs.

The running chute should be at least 20 feet long and preferably curved to prevent the approaching animals from seeing the vat. The width may vary from 18 to 22 inches, depending on the size of the animals, and the sides should be tight-boarded. The height of the chute should be about 40 inches, or high enough to keep the animals from jumping over the sides, but sufficiently low so that the men stationed along the sides to keep the animals moving may work over the top. Hogs will work better in the chute if it slants upward to the slide board.

When hogs emerge from the vat they carry out some of the dip, which runs off their bodies very rapidly. This dip should be saved and returned to the vat, not only because it may be used over and over again but because if it is allowed to drip off in the holding corrals it will collect into pools, from which the animals may drink with possibly injurious results, and even if no hogs are injured in that way the mudholes which form are highly objectionable. Accordingly draining pens with water-tight floors sloping toward the vat or settling wells should be provided to catch and return the dip to the vat. The size shown in the plans may be increased or decreased to correspond to the length of the vat. The floors of the pens may be made of lumber or cement and should have settling wells or water

traps to prevent rain from running into the vat and diluting the dip. A design for a settling well is shown in connection with the cement vat and one for a water trap with the wooden vat. The settling well may be used with the wooden vat, in which case the water trap would be unnecessary, as the settling well serves the same purpose.

In constructing the draining pens of cement it is advisable to build the outer walls in the same manner as the foundations for a house, except that they are to be 6 inches thick. The space inside the walls is to be filled with gravel or other suitable materials to the required height and the sloping floors laid on the tamped gravel. To prevent slipping, the cement floors should be roughened with a stiff broom while the concrete is soft, or a coat of pebble dash may be applied. If wooden floors are used they should be double, with a layer of tar paper between the two floors. Rough lumber may be used for the lower floor but the top one should be of matched boards 1 inch thick. Cleats should be nailed on the floor to prevent the hogs from slipping,

THE DIPPING VAT.

The dipping vat may be constructed of either concrete or lumber, the former being preferable, because when properly made the vat is more durable and in many other ways more satisfactory than when made with lumber. The sides may be perpendicular if desired, but sloping sides are generally considered to be more desirable than perpendicular ones.

The length of the vat may vary from 20 to 40 feet, depending on the number of hogs to be dipped. The top may extend from 9 to 18 inches above the surface of the ground, or may be flush with it, but the former kind affords better conditions for handling the hogs than one flush with the ground. In either style the ground should be graded up to provide a well-drained path along each side of the vat.

The bottom width of the vat with sloping sides may vary from 6 to 12 inches or even more if desired. The slide board should be made of or covered with a smooth-surfaced material, such as planed lumber, sheet metal, or well-troweled concrete. In order that the exit incline or crawling board may not be too steep for hogs to climb up easily the lower end usually is raised about 12 inches above the floor of the vat. (See figs. 10 and 11.) A false floor made of lumber and having cross cleats to prevent slipping may be bolted to the concrete floor of the exit incline, or bricks set on edge in the concrete will answer the same purpose.

If permanent pipes are used for conducting water and dip to the vat they should be laid so as not to act as obstacles to the men working along the vat, but they should enter the vat above the dip line, so that any leakage may be detected. There should be no obstruction in the paths along both sides of the vat; neither should there be

over the top of the vat any crosspieces that may interfere with the proper handling of the hogs while they are in the dip.

In building wooden vats, if softwood is used for the frame timbers they should be 6 by 6 inches, but if hardwood is used 4 by 4 inch timbers are sufficiently large for the purpose. Cedar posts make good framing timbers, as they do not rot rapidly. Matched planks, 2 inches thick, should be used in building the vat, and they should be beveled so that all joints and seams may be properly calked with oakum and rosin, or similar material.

A water trap with hinged cover is shown in the exit incline of the wooden vat. While dipping is in progress both the cover and the valve to the drainpipe should be closed, but when dipping is finished for the day both should be opened, so that, in case of rain, the water from the draining pens may not run into the vat and dilute the dip.

A Concrete Vat.

The trench for a concrete vat should be excavated so that the inside dimensions correspond to the outside dimensions of the completed vat. If the sides of the trench are reasonably firm they may be used for the outer walls of the form, but in all cases in which the vat is extended above the surface of the ground it is necessary to build forms extending from the ground surface to the top of the vat. If the soil is sandy, or the walls cave in, it will be necessary to use outer forms, in which case the trench should be wide enough for them.

The forms usually are made of 1-inch boards and 2 by 4 inch braces, and as a supply of lumber usually is necessary for the corrals and chutes some of it may be used first for the forms and afterwards for constructing corrals and chutes.

All bolts and the drain and other pipes should be placed in position in the forms before the concrete is laid. The concrete should be reinforced with heavy woven wire, and the reinforcements should be placed properly in the forms, so that they may be embedded in the middle of the walls.

The concrete for dipping vats should be made of 1 part of Portland cement by measure, 2½ parts of sand, and 4 parts of screened gravel or crushed stone. The sand should be coarse, clean, and free from foreign matter. The crushed stone or gravel may vary in size from one-quarter to 1 inch in diameter. The mixing should be done on a smooth, tight platform and the sand and rock measured separately in a bottomless box 2 feet long, 2 feet wide, and 1 foot deep, having a capacity of 4 cubic feet. For the 2½ cubic feet mark the inside of the box 7½ inches up from the bottom. Each sack of Portland cement is considered to be equal to 1 cubic foot. Mix the sand and cement thoroughly, add the crushed stone (previously drenched with water), and mix the whole mass by turning it several times with

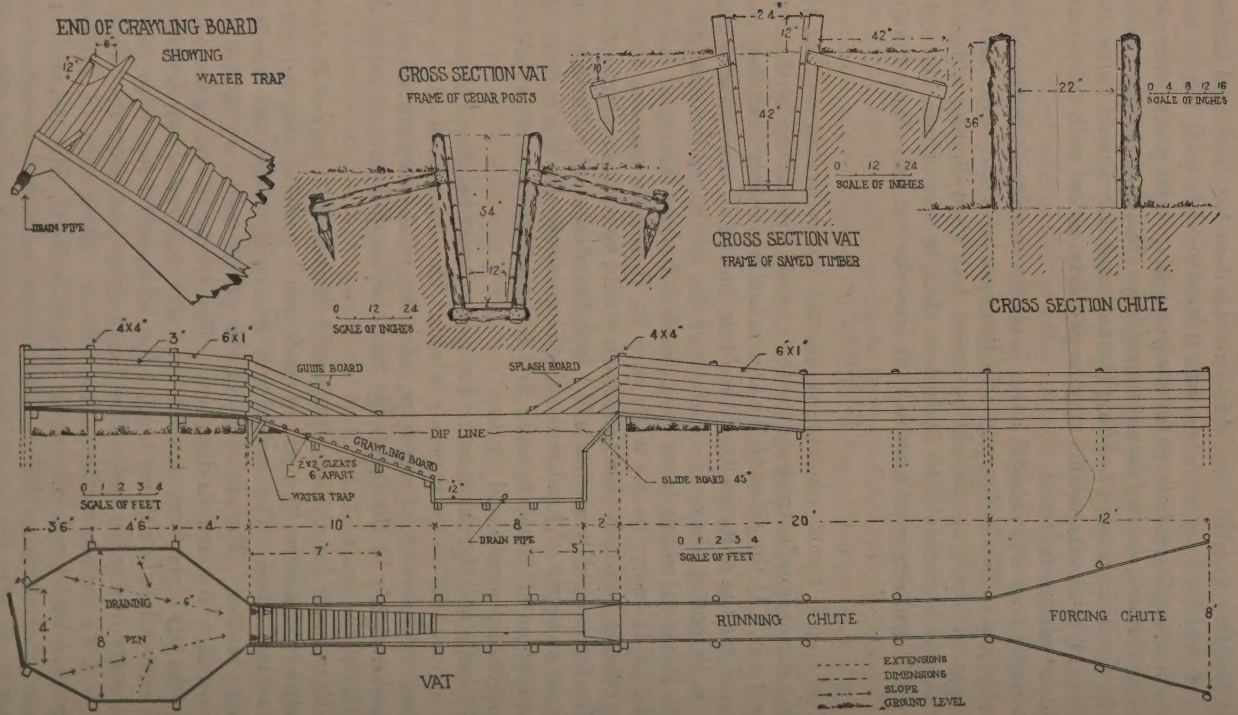

FIG. 10.—Plan of hog-dipping vat—wooden vat

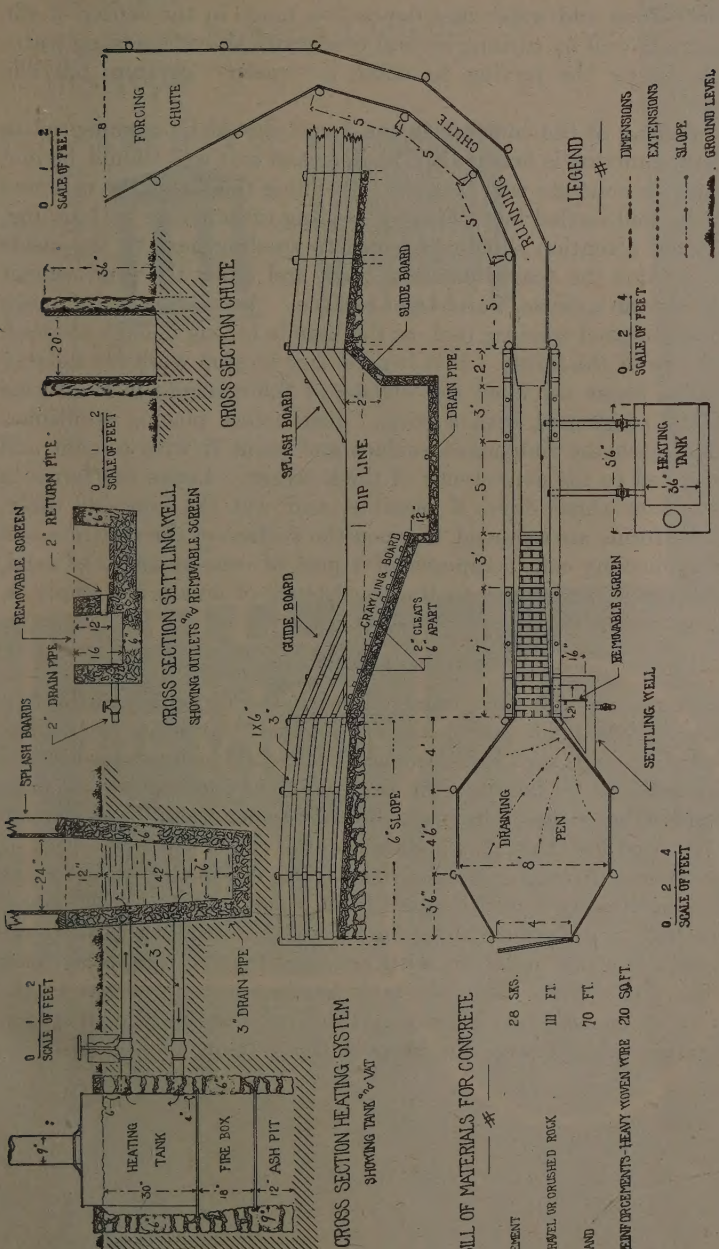

FIG. 11.—Plan of hog-dipping vat—concrete vat.

shovels. Then add water in a depression made in the center of the pile and mix well by turning several times with shovels, adding water enough during the mixing to make a "quaky" or thin, jellylike mixture.

The placing of the concrete in the forms should be commenced as soon as the mixing is finished. The floor and exit end should be laid first and the concrete well tamped. In filling the forms the concrete should be well settled into place by spading rather than by tamping, and special attention should be given to spading next to the inside forms to force the coarse particles back and allow the sand-cement mortar to form a dense, water-tight surface. An old hoe straightened out makes a good spading tool, as the handle is long enough to reach the bottom of the forms. If it is necessary to stop work for the day before the forms are filled the surface of the concrete in the forms should be roughened with a stick. Just before placing additional concrete wash the roughened surface and paint it with cement and water mixed to the consistence of thick cream. Leave the forms in place two or three days, if possible, and wet the concrete daily. After the forms are removed, dampen the surface of the concrete and apply a finishing coat composed of 1 part of cement and 2 of sand, or mix cement and water to the consistence of cream and apply it, brushing well to form a smooth surface.

HEATING FACILITIES.

Heating equipment in connection with the dipping plant is not necessary when crude-petroleum dip is used, but when homemade lime-sulphur dip is used it is necessary to provide facilities for cooking the dip and also for heating it in the vat. The cooking may be done in open kettles or tanks, having a fire box under them, or live steam may be piped into them for boiling the dip.

The commonly used system of heating the dip in the vat is to pipe live steam directly into the liquid from a steam boiler. The steam pipes usually are extended along the floor of the vat at least two-thirds the length, and are provided with openings for the escape of steam into the dip. When the open-tank heating system, shown in the plans for a concrete vat, is used, settling wells are not necessary, as the heating tank answers the purpose of a settling well.

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